Appendix

Appendix A: Glossary of Terms

Abbreviations

AFV . . . . . alternative fuel vehicle
ALVW . . . . . adjusted loaded vehicle weight
APCD . . . . . Air Pollution Control Division (Colorado)
BAR . . . . . Bureau of Automotive Repair
CAA. . . . . Clean Air Act
CAFE . . . . . corporate average fuel economy
CARB. . . . . California Air Resources Board
CD . . . . . Certification Division
CFF . . . . . Clean-Fuel Fleet
CFFP . . . . . Clean-Fuel Fleet Program
CFR . . . . . *Code of Federal Regulations*
CFV . . . . . clean-fuel vehicle
CNG. . . . . compressed natural gas
CO . . . . . carbon monoxide
CO_2 . . . . . carbon dioxide
CPP . . . . . California Pilot Program
DDV. . . . . durability data vehicle
DF or DFs . . deterioration factor or factors
DOE. . . . . U.S. Department of Energy
DOT. . . . . U.S. Department of Transportation
EDV . . . . . emissions data vehicle
EO . . . . . Executive Order (California)
EPA . . . . . U.S. Environmental Protection Agency
EPACT. . . . . Energy Policy Act of 1992
FIP . . . . . Federal Implementation Plan
FR. . . . . *Federal Register*
FTP. . . . . Federal Test Procedure
GVWR. . . . . gross vehicle weight rating
HC . . . . . hydrocarbons
HCHO. . . . . formaldehyde
HDDE . . . . . heavy-duty diesel engine (diesel-cycle)
HDE. . . . . heavy-duty engine
HDGE . . . . . heavy-duty gas engine (Otto-Cycle)
HDV . . . . . heavy-duty vehicle
HHDDE . . . heavy heavy-duty diesel engine (diesel-cycle)
HLDT . . . . . heavy light-duty truck
HOV . . . . . high-occupancy vehicle
ILEV. . . . . inherently low-emission vehicle
IM. . . . . inspection and maintenance
LDT . . . . . light-duty truck
LDT1 . . . . . light-duty truck 1
LDT2 . . . . . light-duty truck 2
LDT3 . . . . . light-duty truck 3
LDT4 . . . . . light-duty truck 4
LDV . . . . . light-duty vehicle
LEV . . . . . low-emission vehicle
LHDDE . . . . light heavy-duty diesel engine (diesel-cycle)
LLDT . . . . . light light-duty truck
LNG. . . . . liquefied natural gas
LPG . . . . . liquefied petroleum gas
LVW. . . . . loaded vehicle weight
MAC . . . . . Manufacturers Advisory Correspondence (California)
MDV . . . . . medium-duty vehicle
MDV1 . . . . . medium-duty vehicle 1
MDV2 . . . . . medium-duty vehicle 2
MDV3 . . . . . medium-duty vehicle 3
MDV4 . . . . . medium-duty vehicle 4
MDV5 . . . . . medium-duty vehicle 5
MERC . . . . . Mobile Emissions Reduction Credit (federal term)

MHDDE . . . medium heavy-duty diesel engine (diesel-cycle)
MSERC . . . . Mobile Source Emissions Reduction Credit (California term)
MY . . . . . model year
NAAQS. . . . National Ambient Air Quality Standards
NMHC . . . . non-methane hydrocarbons
NMOG . . . . non-methane organic gases
NO_x . . . . . oxides of nitrogen
NREL. . . . . National Renewable Energy Laboratory
OBD. . . . . on-board diagnostics
OBD II . . . . . on-board diagnostics II
OEM . . . . . original equipment manufacturer
PC . . . . . passenger car
PM . . . . . particulate matter
QVM . . . . . Qualified Vehicle Modifier
RAF . . . . . reactivity adjustment factor
SIP . . . . . State Implementation Plan
SULEV. . . . . super-ultra-low-emission vehicle
THC. . . . . total hydrocarbons
TLEV . . . . . transitional low-emission vehicle
TW . . . . . test weight
ULEV. . . . . ultra low-emission vehicle
VIN . . . . . vehicle identification number
ZEV . . . . . zero-emission vehicle

Definitions

Adjusted loaded vehicle weight (ALVW): the numerical average of the curb weight and the GVWR.

Aftermarket conversion: a vehicle originally designed to operate on gasoline or diesel that has been modified or altered to run on an alternative fuel. (See also 40 CFR Part 85.502(c).)

Alternative fuel: in the context of this guide, alternative fuel refers to CNG, LNG, and LPG.

Baseline emissions: emissions measured from relatively new vehicles or engines. Baseline emissions are compared with emissions at higher mileage levels to determine DFs.

Bi-fuel vehicle (industry definition): a vehicle with two separate fuel systems designed to run on either an alternative fuel, or gasoline or diesel, using only one fuel at a time. CARB defines bi-fuel differently, which can create confusion.

Bi-fuel vehicle (CARB definition): a vehicle with two fuel systems (the conventional fuel and an alternative fuel) capable of running on either the conventional fuel (gasoline or diesel) or both the conventional and alternative fuel simultaneously.

Clean-fuel vehicle (CFV): any vehicle certified by the EPA as meeting CFV federal emissions standards. The three categories of federal CFV standards from least to most stringent are LEV, ULEV, and ZEV. The ILEV standard is voluntary and does not need to be adopted by states as part of the Clean-Fuel Fleet Program (CFFP). CFVs are eligible for two federal programs, the California Pilot Program and the CFFP. CFV exhaust emissions standards for light-duty vehicles and trucks are numerically similar to those of California's Low-Emissions Vehicle Program.

Clean-Fuel Fleet Program (CFFP): a federal program that requires fleet purchase of CFVs beginning in model year 1999.

Compressed natural gas (CNG): natural gas that has been compressed under high pressure. When used as a motor vehicle fuel, it is stored in specially designed cylinders at pressures up to 3,600 pounds per square inch (see also natural gas).

Conventional fuel: in the context of this guide, conventional fuel refers to gasoline or diesel.

Converted or conversion: (see aftermarket conversion)

Corporate Average Fuel Economy (CAFE): a program created to determine vehicle manufacturers' compliance with the fuel economy standards set by the federal government. The Energy Policy and Conservation Act, which passed in 1975, set the first federal fuel economy standards for light-duty vehicles and trucks. The CAFE values are a weighted harmonic average of the EPA city and highway fuel economy test results.

Conversion kit: equipment used to modify a vehicle originally designed to operate on gasoline or diesel that has been modified or altered to run on an alternative fuel.

Curb weight: the manufacturer's estimated weight of the vehicle in operational status with all standard equipment and weight of fuel at normal tank capacity, and the weight of optional equipment.

Dedicated alternative fuel vehicle: a vehicle that has been designed or modified to run on an alternative fuel only.

Deterioration factor (DF): a numerical factor that is determined through various durability test procedures and used to predict the increase in vehicle emissions caused by age or mileage accumulation. These factors are applied to baseline emissions test results to determine compliance with useful life emissions standards. Some are multiplied and others are added to the baseline emission results.

Diesel engine: any engine powered by diesel fuel or a gaseous fuel for which the diesel engine speed/torque characteristics and vehicle applications are retained. (Commonly referred to as a compression-ignition engine.)

Distributor: a company or individual that purchases aftermarket conversion equipment or kits for the purpose of reselling to other companies or individuals, such as an installer, without installing the conversion kit.

Dual-fuel vehicle (CAA/EPA/CARB definition): a vehicle with two separate fuel systems designed to run on either an alternative fuel or conventional gasoline, using only one fuel at a time. We use this definition for dual-fuel in this guide. (See also 40 CFR Part 88.102-94.)

Dual-fuel vehicle (industry/EPACT definition): a vehicle designed to operate on a combination of an alternative fuel and a conventional fuel, including: (1) vehicles using a mixture of gasoline or diesel and an alternative fuel in one fuel tank, commonly called flexible-fuel vehicles; and (2) vehicles capable of operating either on an alternative fuel, a conventional fuel, or both, simultaneously using two fuel systems.

Durability: a vehicle's or engine's ability to maintain a given emissions level over its useful life. Durability tests are performed by manufacturers to predict the emissions deterioration rate with increased mileage (see also DFs and useful life).

Durability data vehicle (DDV): a vehicle used to test for deterioration of emissions over a period of use. The test results are used to determine DFs.

Emissions data vehicle (EDV): a vehicle used to test for baseline emissions. DFs are applied to the baseline emissions results to determine compliance with useful life emissions standards.

Engine family: the EPA and CARB define engine family as a group of engines with the same emissions characteristics throughout their useful life. The engines must be identical in a number of respects such as cylinder bore center-to-center dimensions, cylinder block configuration, location of the intake and exhaust valves, method of air inspiration, combustion cycle, and catalytic converter characteristics.

Evaporative emissions: hydrocarbon vapors that escape from a fuel storage tank, a vehicle fuel tank, or a vehicle fuel system.

Full useful life: (see useful life)

Gross vehicle weight rating (GVWR): maximum loaded weight for which the vehicle is designed, as specified by the vehicle manufacturer.

Heavy-duty engine: a diesel or an Otto-Cycle engine that powers a heavy-duty vehicle. The EPA designation for a heavy-duty vehicle is any vehicle above 8,500 pounds GVWR; the CARB designation is for any vehicle above 6,000 pounds GVWR. Exhaust emission testing is carried out on a engine dynamometer.

Heavy-duty vehicle: (see heavy-duty engine)

Inherently low-emission vehicle (ILEV): a vehicle meeting EPA's CFV ILEV standards (federal only—see Appendix D). Evaporative emissions must be 5 grams or less per test without using any and all auxiliary emission control devices. In most cases, ILEVs will be dedicated AFVs. Dual-fuel vehicles will be considered ILEVs only if both fuels meet the standard. ILEVs may be exempt from certain transportation control measures, including HOV lane restrictions. This standard is voluntary and need not be adopted by states.

Installer: any company or individual that installs an aftermarket conversion system on a vehicle or engine. (See also 40 CFR Part 85.502(d).)

Intermediate useful life: (see useful life)

Light-duty truck (LDT): there are a number of different vehicle weight categories within the light-duty truck vehicle designation. The EPA designation for light-duty truck is any truck with a GVWR of 8,500 pounds or less and a curb weight of 6,000 pounds or less; the CARB designation applies to any truck with a GVWR of less than 6,000 pounds.

Light-duty vehicle (LDV): an EPA term that means a passenger car or passenger-car derivative capable of seating 12 or fewer passengers (see also passenger car).

Liquefied natural gas (LNG): natural gas that has been condensed to a liquid—typically, by cryogenically cooling the gas (see also natural gas).

Liquefied petroleum gas (LPG): also known as propane, a mixture of hydrocarbons found in natural gas and also produced from crude oil. In addition to its use as a vehicle fuel, it is used principally as a feedstock for the chemical industry, a home heating fuel, and a motor vehicle fuel. When used as a motor vehicle fuel, the primary component of LPG is propane.

Loaded vehicle weight (LVW): a vehicle's curb weight plus 300 pounds.

Low-emission vehicle (LEV): a vehicle that meets either the EPA's CFV LEV standards or California's Low-Emission Vehicle Program standards (see Appendix D). LEVs produce fewer emissions than TLEVs.

Medium-duty vehicle (MDV): CARB term that means any pre-1995 model year heavy-duty vehicle having a GVWR of 8,500 pounds or less; any 1992 and subsequent model year heavy-duty LEV, ULEV, SULEV, or ZEV having a GVWR of 14,000 pounds or less; or any 1995 and subsequent model year heavy-duty vehicle having a GVWR of 14,000 pounds or less. Exhaust emissions testing of MDVs is performed on a chassis dynamometer.

Model year: an OEM's annual production period. Further, a specific model year must include January 1 of that calendar year and not include January 1 of any other calendar year. The maximum duration of the model year is one calendar year plus 364 days. (See also 40 CFR Part 85.2302 and 85.2303.)

Natural gas: a mixture of gaseous hydrocarbons, primarily methane, which occurs naturally in the earth and is used principally as a fuel.

Non-methane organic gas (NMOG): the sum of non-oxygenated and oxygenated hydrocarbons contained in a gas sample as measured in accordance with California's test procedures. With vehicles using fuels other than gasoline, the level of NMOG emissions is adjusted based on the reactivity of the emissions relative to vehicles using gasoline.

Nonattainment area: a region, determined by population density in accordance with the U.S. Census Bureau, which exceeds minimum acceptable National Ambient Air Quality Standards (NAAQS) for one or more "criteria pollutants." Such areas are required to seek modifications to their State Implementation Plans,

setting forth a reasonable timetable for meeting NAAQS using EPA-approved means. Under the CAA, if a nonattainment area fails to meet NAAQS, the EPA may impose a Federal Implementation Plan with stricter requirements, or impose fines, construction bans, or cutoffs in federal grant revenues, until the area achieves the applicable NAAQS.

Office of Mobile Sources: a division of the EPA that proposes, promulgates, and enforces regulations to control emissions from motor fuels, vehicles, motor vehicle engines, and non-road engines.

On-board diagnostics system (OBD system): a system made up of sensors, actuators, the OBD computer (which is usually the same as the electronic control unit that controls other engine functions) and its software, and interconnecting cables and wires. Its purpose is to ensure proper emission control system operation for the useful life of the vehicle by monitoring emissions-related components and systems for deterioration and malfunction.

On-board refueling vapor recovery (ORVR): a system required on vehicles beginning in 1998 to recover hydrocarbon vapors that escape during refueling.

Otto-Cycle engine: any engine in which the primary means of controlling power output is by limiting the amount of air and fuel that can enter the combustion chambers of the engine (commonly referred to as a spark-ignited engine).

Passenger car (PC): CARB term meaning any motor vehicle designed primarily for transportation of persons and having a design capacity of 12 or fewer persons (see also light-duty vehicle).

Reactivity adjustment factor (RAF): numerical multipliers used in the certification of vehicles to the California emissions standards to reflect reduced ozone-forming potential of emissions from various fuels, especially alternative fuels.

Retrofit: (see aftermarket conversion)

Super-ultra-low-emission vehicle (SULEV): an MDV in California that produces fewer emissions than a ULEV vehicle (see Appendix D). Because there is no federal equivalent, such a vehicle qualifies as a ULEV vehicle under the CFFP.

Tier 0: federal emissions standards for LDVs and trucks prior to the tier 1 phase (see Appendix D).

Tier 1: more stringent federal emissions standards for LDVs and LDTs phased in beginning in MY 1994 and required for all 1996 model year light-duty vehicles and trucks (see Appendix D).

Transitional low-emission vehicle (TLEV): a vehicle that meets either the EPA's TLEV standards or California's Low-Emissions Vehicle Program TLEV standards (see Appendix D). TLEVs produce fewer emissions than federal tier 1 vehicles. TLEVs are eligible for the federal California Pilot Program but are not eligible for the federal CFFP.

Ultra low-emission vehicle (ULEV): a vehicle that meets either the EPA's CFV ULEV standards or California's Low-Emission Vehicle Program ULEV standards (see Appendix D). ULEVs produce fewer emissions than LEVs. Fleets that purchase CFV ULEVs may earn credits under the CFFV Program. Manufacturers that sell CFV ULEVs may earn credits under the federal California Pilot Program.

Useful life: a period of vehicle or engine use expressed in years or miles defining the emissions standards to which a vehicle or engine is being certified. Vehicles or engines are certified to meet emissions standards that are projected out to their intermediate or full useful life (such as five years or 50,000 miles, whichever comes first; ten years or 100,000 miles, whichever comes first, etc.). Baseline emissions tests are performed and DFs are applied to determine if the vehicle will meet the standards defined for a given useful life.

Zero-emission vehicle (ZEV): a vehicle that meets either the EPA's CFV ZEV standards or CARB's California Low-Emission Vehicle ZEV standards. ZEV standards, usually met with electric vehicles, do not permit any exhaust emissions of the regulated pollutants or evaporative emissions during vehicle use.